

We claim:

1. A process for disinfecting mammalian teat skin comprising contacting said substrate with an aqueous teat dip composition consisting essentially of water and an effective amount of a protic acid, or a material inducing an acidic environment therein, and an effective amount of a water soluble metal nitrite to produce nitrous acid from said acid and said metal nitrite, said composition containing an amount of nitrous acid which is no more than about 95% by weight of the total amount of nitrite ion and nitrite as nitrous acid in said composition.

2. The process according to claim 1 wherein the metal nitrite is present at a level of from about 0.03% to about 0.7% by weight based on the total weight of the composition.

3. The process according to claims 1 or 2 wherein the metal nitrite is sodium nitrite.

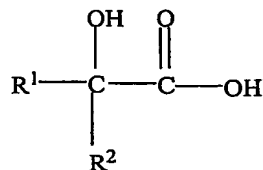
4. The process according to any of claims 1-3 wherein the protic acid is an organic acid.

5. The process of claim 4 wherein the organic acid has a pK_a value in the range of about 2.8 to about 4.8.

6. The process of claim 4 wherein the organic acid has a pK_a value in the range of about 2.8 to about 4.2.

7. The process of claim 4 wherein the organic acid has a pK_a value in the range of about 3.0 to about 4.0.

8. The process according to any of claims 4-7 wherein said acid is an α -hydroxy acid of the general formula:



wherein R^1 and R^2 may be the same or different and may be selected from the group consisting of hydrogen, methyl, $-\text{CH}_2\text{COOH}$, $-\text{CH}_2\text{COO}^-$, $-\text{CH}_2\text{OH}$, $-\text{CHOHCOOH}$, $-\text{C}_6\text{H}_5$, and $-\text{CH}_2\text{C}_6\text{H}_5$.

9. The process of claim 5 wherein the organic acid ranges from about 0.03% to about 3% by weight of the total composition.

10. The process according to any of claims 1-9 wherein said aqueous composition has a pH of less than about 4.5.

11. The process according to any of claims 1-10 wherein said aqueous composition has a pH ranging from about 2.5 to about 4.0.

12. The process according to any of claims 1-11 wherein said aqueous composition has a pH ranging from about 2.5 to about 3.5.

13. The process according to any of claims 1-3 wherein the protic acid is an inorganic acid.

14. The process of claim 13 wherein the inorganic acid is selected from the group consisting of nitric acid, hydrochloric acid, sulfuric acid, sodium hydrogen sulfate and phosphoric acid.

15. The process of claim 1 wherein the teat dip composition is a thickened composition comprising a gelling or film-forming agent.

16. The process according to claim 15 wherein said thickened composition remains on the teat upon drying of the composition thereon.

17. The process according to claim 15 or 16 wherein said gelling or film-forming agent comprises about 0.5 percent to about 30 per cent by weight of said composition, typically from about 1 percent to about 15 percent, and preferably at about 1 percent to about 12 percent.

18. The process of any of claims 1 and 5-9 wherein the aqueous teat dip composition retains significant microbiocidal activity for a period of at least about 24 hours after preparation.

19. The process of any of claims 1 and 5-9 wherein the aqueous teat dip composition retains significant microbiocidal activity for a period of at least about three weeks after preparation.

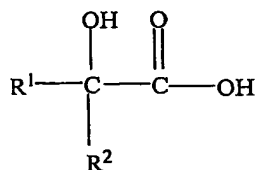
20. The process of any of claims 1 and 5-9 wherein the aqueous teat dip composition retains significant microbiocidal activity for a period of at least about two weeks after preparation.

21. The process according to any of claims 1-20 wherein the mammalian skin is that of a cow.

22. A long-acting antimicrobial composition comprising a single-phase liquid or gel comprising an antimicrobially effective amount of nitrous acid and a protic acid wherein said composition comprises about 0.03% to about 0.70% by weight of a metal nitrite and said protic acid is included in said composition in an amount effective to produce a pH of less than about 4.5 in said composition and wherein said antimicrobial activity is maintained in said composition for a period of at least about 48 hours.

23. The composition according to claim 22 wherein said acid is an α -hydroxy acid having a pKa value ranging from about 2.1 to about 4.8, said pH of said composition ranging from about 2.5 to about 4.0.

24. The composition according to claim 22 or 23 wherein said protic acid has the chemical structure:



wherein R^1 and R^2 may be the same or different and may be selected from the group consisting of hydrogen, methyl, $-\text{CH}_2\text{COOH}$, $-\text{CH}_2\text{COO}^-$, $-\text{CH}_2\text{OH}$, $-\text{CHOHCOOH}$, $-\text{C}_6\text{H}_5$, and $-\text{CH}_2\text{C}_6\text{H}_5$.

25. A composition according to any of claims 22-24, wherein the nitrous acid is generated by a sodium or potassium nitrite.

26. A composition according to any of claims 22-25, wherein the composition is a liquid teat dip.

27. A composition according to any of claims 22-25, wherein the composition is a gel.

28. A composition comprising a single-phase liquid or gel comprising nitrous acid and an α -hydroxy acid, wherein:

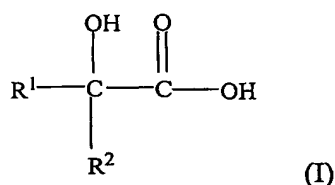
(a) the pH of the composition either remains relatively constant at an initial value of around 3.7 or lower, or decreases from said initial value of around 3.75 or lower at the time of formulation to a value as low as around 2.5 over a period of at least about two days, preferably about two days to five days;

(b) the molar percentage of nitrite ion in the composition in the form of nitrous acid is greater than about 35% but less than about 95% of the total nitrite ions present in the composition; and

(c) the composition exhibits cidal activity against microorganisms for a period of at least three weeks after formulation.

29. A composition of claim 28, wherein the composition comprises a compound comprising an amount of phosphoric acid with a pK_a of about 2.15 that is sufficient to lower the pH of the composition to less than about 3.75.

30. A composition according to claim 28 or 29, wherein the α -hydroxy acid is a compound of the formula (I):



wherein R^1 and R^2 may be the same or different and may be selected from the group consisting of hydrogen, methyl, $-\text{CH}_2\text{COOH}$, $-\text{CH}_2\text{COO}^-$, $-\text{CH}_2\text{OH}$, $-\text{CHOHCOOH}$, $-\text{C}_6\text{H}_5$, and $-\text{CH}_2\text{C}_6\text{H}_5$.

31. A composition according to any of claims 28-30, wherein the composition further comprises one or more of the following components: a surface active agent, a chelating agent, an effervescent compound, a preservative, a coloring agent, an opacifier and a thickener.

32. A composition according to any of claims 28-31, wherein the cidal activity of the composition over a period of about twenty-four months or more after formulation is comparable to the activity that it demonstrated initially.

33. A composition according to any of claims 28-32, wherein the cidal activity of the composition over a period of about five minutes or more after formulation is equivalent to the activity necessary to achieve an approximately eight log decrease in a sample of *E. coli*.

34. A composition according to any of claims 28-33, wherein the composition is used in conjunction with an application medium.

35. A composition according to any of claims 28-34, wherein the nitrous acid is generated by a metal nitrite.

36. A composition according to any of claims 28-35, wherein the composition may be used as a liquid teat dip.

37. A composition according to 28-36, wherein the composition is a gel.

38. A method comprising disinfecting a substrate by application thereto of a composition according to any of claims 28-35.

39. A method comprising disinfecting mammalian tissue by application to said tissue of a composition according to any of claims 28-37.

40. The method according to claim 38 wherein said substrate is a metal surface.

41. A method according to any of claims 38-40 wherein said composition comprises an amount of nitrite in the form of nitrous acid that is no more than about 85% by weight of the total nitrite ions in the composition.

42. The method according to any of claims 38-41, wherein the composition is a disinfecting gel comprising a thickener.

43. The method according to any of claims 38-39, wherein the composition is an oral rinse.

44. The method according to any of claims 38-43 wherein said application of said composition occurs over a period of at least about several months.

45. The method according to any of claims 38-39 and 41-44 wherein the substrate is mammalian tissue.

46. The method according to any of claims 38-41 and 43-45 wherein the composition is sprayed onto the substrate.

47. Use of a composition according to any of claims 22-37 in the manufacture of a disinfectant for a substrate

48. Use according to claim 47 wherein said substrate is mammalian tissue.

49. Use according to claim 48 wherein said mammalian tissue is cow tissue.

50. Use according to claim 49 wherein said cow tissue is a cow teat.

51. Use according to claim 50 wherein said substrate is a metal substrate.